CITY OF SCOTTSDALE

Abbreviated Water and Sewer Needs

Basis of Design Report

Sewer

Deer Valley Townhomes

NWC of Miller Road & Deer Valley Road

City of Scottsdale

Maricopa County, Arizona

TSC Project No. 0800

July 2019

Prepared for:

Beardsley 22, Inc
222 W Linger Lane,
Phoenix, AZ 85021

FINAL Basis of Design Report

☐ APPROVED

☑ APPROVED AS NOTED

☐ REVISE AND RESUBMIT

CITY OF SCOTTSDALE

SCOTTSDALE WATER

9379 E San Salvador Dr.
Scottsdale, AZ 85258

Disclaimer: If approved; the approval is granted under the condition that the final construction documents submitted for city review will match the information herein. Any subsequent changes in the water or sewer design that materially impact design criteria or standards will require re-analysis, re-submittal, and approval of a revised basis of design report prior to the plan review submission.; this approval is not a guarantee of construction document acceptance.
For questions or clarifications contact the Water Resources Planning and Engineering Department at 480-312-5685.

BY scan **DATE** 9/10/2019

Note: 6-inch sewer will be designated as private and will not be maintained by City of Scottsdale

Registered Professional Engineer (Civil)
CERTIFICATE NO.
41715
LISA
NELSON
Date Signed
07/15/19
ARIZONA U.S.A.

EXPIRES 12/31/2019

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43-DR-2019
08/14/19

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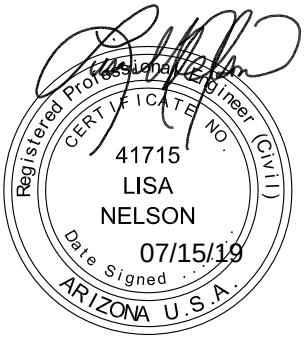


EXPIRES 12/31/2019

43-DR-2019
08/14/19

1.0 Introduction

The proposed Deer Valley Townhomes development (Project) consists of attached townhomes split between three (3) buildings on a one acre parcel. The Site is defined by the parcel boundary for APN# 212-02-010E and is located at the northwest corner of Miller Road and Deer Valley Road in Scottsdale (see figure 1 below). The current project zoning is PCOC and proposed project zoning is R-3. The site is currently undeveloped and the proposed development will be constructed all at once and will not be phased.

The purpose of this report is to evaluate the existing infrastructure and to determine if the proposed design will adequately support the calculated demands for the proposed developed Site. The Project will be designed and developed in accordance with the 2018 City of Scottsdale Design Standards & Policies Manual (DSPM), County, and State requirements.

Figure 1: Location Map

2.0 Sewer System

The site is a vacant lot with a channel along the east side. There are several existing sewer lines surrounding the property, according to City quarter section maps. Deer Valley Road has an existing 8" VCP sanitary sewer line that flows east to west. An 8" PVC sewer line exists in Miller Road that flows south. An existing sewer line exists in Calistoga Circle with a service stub extends into the Site at the northwest corner. **Appendix A** shows the exact connection location. The proposed sewer system will utilize the existing sewer stub to the property and tie into the main within Calistoga Circle. A 6" PVC sewer line will service the site with 4" laterals to each home.

private

Based on discussions with the City of Scottsdale, the downstream sewer main and wastewater treatment plant has sufficient capacity to support the Project's sewer proposed flows. The sewer flow from the Project will be conveyed to the City of Scottsdale Wastewater Treatment Plant, 4.2 miles downstream.

3.0 Sewer Analysis

3.1 Jurisdictional Design Criteria

Based on the DSPM all sewer lines shall be designed to provide a minimum peak flow velocity of 2.5 feet per second when flowing completely full and a maximum velocity of 10.0 feet per second. A Manning's roughness coefficient, "n", of 0.013 will be used for all pipe materials. Per MAG Standard Detail 404, the minimum slope requirement for six (6) inch diameter sewer service is 2.08%. Upon completion of the plumbing design in the construction document phase, the service lines to each home or structure will be sized. Cleanouts are located at any direction change greater than 45° or at the end of the line. All buildings are required to have a two-way cleanout at the building per 2015 International Plumbing Code (IPC). Cleanout spacing is equal to or less than 100'.

3.2 Proposed Wastewater Flows

This report supplements preliminary plans proposing 9 residential units. As a result, the final total projected wastewater flow is calculated as follows:

Average Daily Demand =	100 gpcpd
Average Daily Flow (ADF) = 9 DU x 100 gpcpd x 2.5 p/DU =	2,250 gpd
Peak Daily Flow (PDF) = ADF x 4.0 =	9,000 gpd

*ADF based on DSPM section 7-1.403.A
*PDF based on DSPM figure 7-1.2

43-DR-2019
08/14/19

3.3 Sewer Calculations

Flow capacity per Manning's formula for uniform pipe flow:

$$Q = \frac{1.49}{n}(A)(R_h)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

Q =	*Pipe capacity (cfs)*
n =	*Manning's roughness coefficient*
A =	*Cross sectional area (ft²)*
R =	*Hydraulic radius (ft.)*
S =	*Minimum slope (ft/ft)*

Capacity for a full flowing 6" diameter pipe with a minimum slope of 0.0208 ft/ft:

$$\frac{1.49}{0.013}(\pi 0.25^2)(0.13)^{\frac{2}{3}}(0.0208)^{\frac{1}{2}} = 0.81\ cfs = 523{,}517\ gpd$$

9,000 gpd << 523,517 gpd pipe capacity

Flow velocity per Manning's formula for uniform pipe flow:

$$V = \frac{1.49}{n}(R_h)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

V =	*Pipe velocity (ft/s)*
n =	*Manning's roughness coefficient*
R_h =	*Hydraulic radius (ft.)*
S =	*Minimum slope (ft/ft)*

The full-flow velocity computed for a 6" sewer line:

$$\frac{1.49}{0.013}(0.13)^{\frac{2}{3}}(0.0208)^{\frac{1}{2}} = 4.12\ ft/s$$

4.12 fps > 2.5 fps

4.0 Conclusion

As demonstrated, the proposed sewer system for Deer Valley Townhomes will be in accordance with the 2018 City of Scottsdale Design Standards & Policies Manual and have the capacity to service 9 townhomes on a one acre site. The proposed demand is well under the proposed capacity and an acceptable velocity is obtained.

APPENDIX A

PRELIMINARY GRADING & DRAINAGE PLAN

Flow	
Q= CIA**	Q = Flow (cfs)
	C = Average Runoff Coefficient*
Q = 0.94 x 8.05 x 0.68	I = Precipitaion Intensity (100-yr, 5-min) (in/hr)
Q = 5.15 cfs	A = Net Area of Disturbed Area (ac)

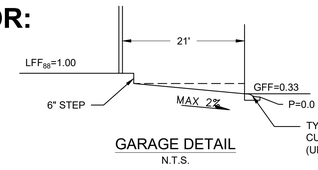
*C-Values are from FCDMC Hydrology Manual

First Flush Volume	
V= CDA**	V = First Flush Volume (cf)
	C = Average Runoff Coefficient*
V = 0.94 x 0.042 x 29,597	D = First Flush Precipitation Depth (1/2") (ft)
V = 1,168 cf	A = Net Area of Disturbed Area (sf)

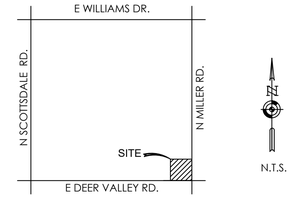
*C-Values are from FCDMC Hydrology Manual
**First Flush equation is from COS Design Manual

PRELIMINARY GRADING AND DRAINAGE PLAN FOR:
DEER VALLEY TOWNHOMES
N MILLER ROAD & E DEER VALLEY ROAD
SCOTTSDALE, ARIZONA

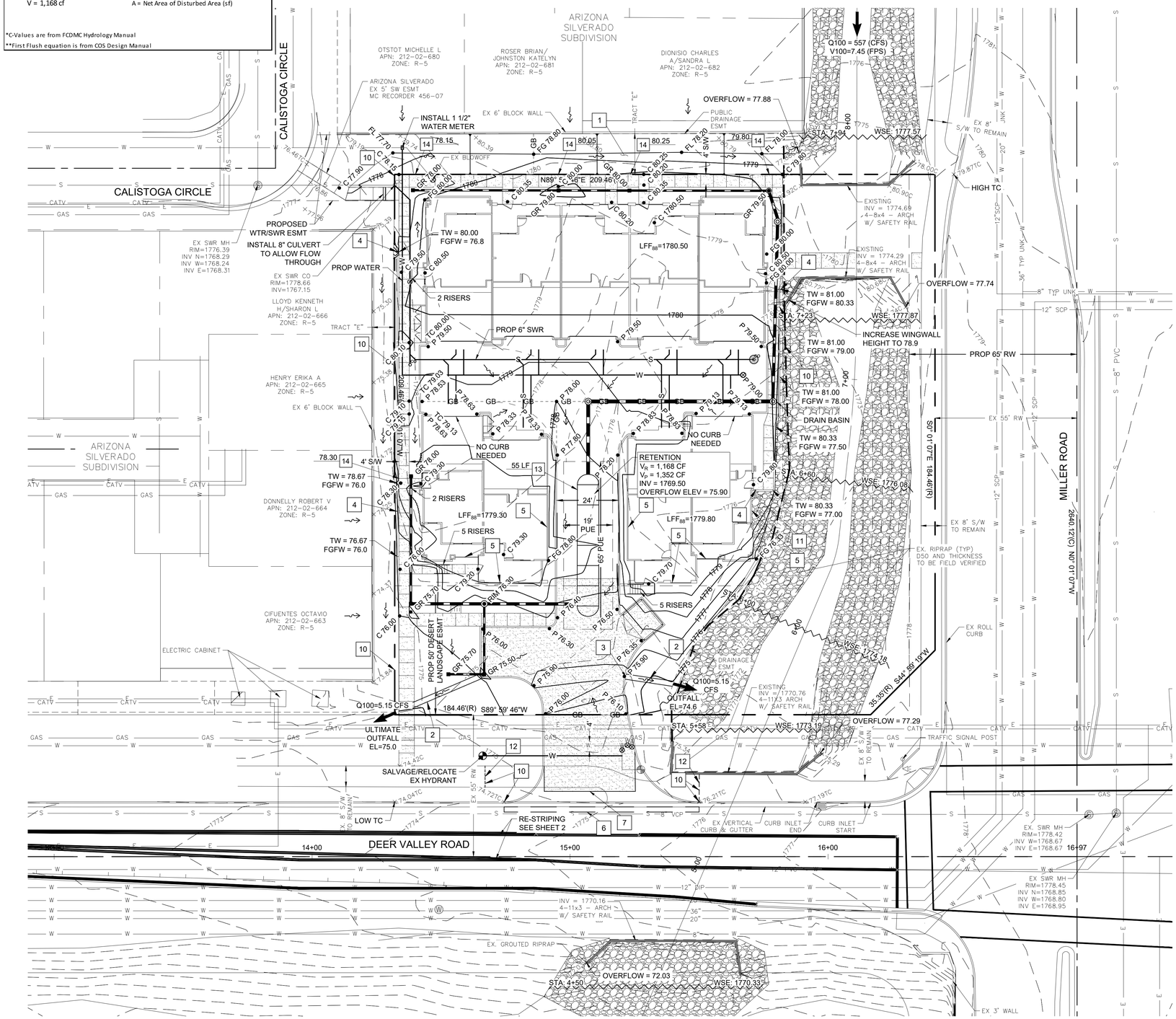
A PORTION OF THE SOUTHWEST QUARTER OF SECTION 14, TOWNSHIP 4 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA.



GARAGE DETAIL
N.T.S.



VICINITY MAP



OWNER / DEVELOPER

BEARDSLEY 22, INC
222 W LINGER LN, PHOENIX, AZ 85021

CONTACT: SCOTT WARD
PHONE: (480) 899-4330
EMAIL: WARDDEVELOPMENT@YAHOO.COM

ARCHITECT

WHITNEYBELL PERRY, INC
575 W CHANDLER BLVD, SUITE 123
CHANDLER, ARIZONA 85224

CONTACT: TERESA HILL
PHONE: (480) 857-8364
EMAIL: TERESA@WHITNEYBELLPERRY.COM

CIVIL ENGINEER

TERRASCAPE CONSULTING
1102 EAST MISSOURI AVENUE
PHOENIX, ARIZONA 85014

CONTACT: LISA NELSON, P.E.
PHONE: (480) 454-1807
FAX: (602) 230-2458
EMAIL: LNELSON@TERRASCAPE.US

PROJECT DATA:

APN:	212-02-010E
NET AREA:	0.68 ACRES
TOTAL DISTURBED AREA:	0.68 ACRES
PARCEL AREA:	1.00 ACRES
ADDRESS:	21818 N MILLER RD, SCOTTSDALE, AZ 85255

BASIS OF BEARING

THE SOUTH LINE OF SECTION 14, TOWNSHIP 4 NORTH, RANGE 4 EAST. SAID LINE HAVING AN ASSUMED BEARING OF N 89° 32' 09" E.

BENCHMARK

A CITY OF SCOTTSDALE BRASS CAP IN HANDHOLE AT THE INTERSECTION OF SCOTTSDALE ROAD AND DEER VALLEY ROAD, C.O.S ELEVATION = 1747.03 (NAVD 88).

FEMA FLOOD INFORMATION

FLOOD ZONE DESIGNATION "X" F.E.M.A. FLOOD INSURANCE RATE MAP, MAP NUMBER 04013C1320L, PANEL 1320 OF 4425, DATED AUGUST 25, 2017. ZONE "X" AREAS DETERMINED TO BE OUTSIDE OF 0.2% ANNUAL CHANCE FLOODPLAIN.

LEGEND

BOUNDARY	FIRE HYDRANT
EX PROPERTY LINE	CLEAN OUT WITH COLLAR
SETBACK	CLEAN OUT
EASEMENT	VALVE
STORM DRAIN	4' MANHOLE
S SANITARY SEWER LINE	CATCH BASIN
W DOMESTIC WATERLINE	YARD DRAIN
FW FIRELINE	BACKFLOW PREVENTER
DRYWELL	WATER METER
STORMTECH RETENTION TANK	93.0 FINISHED GRADE
GB GRADE BREAK LINE	WSE HEC-RAS CROSS SECTIONS WATER SURFACE ELEVATION
EROSION SETBACK	COLORED PORTLAND CEMENT CONCRETE

ABBREVIATIONS

BLDG	BUILDING	LS	LANDSCAPE
C	CONCRETE	MH	MANHOLE
C&G	CURB AND GUTTER	P	PAVEMENT
CO	CLEAN OUT	PROP	PROPOSED
CMP	CORRUGATED METAL PIPE	PUE	PUBLIC UTILITY EASEMENT
DIA	DIAMETER	RW	RIGHT OF WAY
EL/ELEV	ELEVATION	SB	SETBACK
ESMT	EASEMENT	SS	SANITARY SEWER
EX	EXISTING	S/W	SIDEWALK
LFF_{88}	FINISHED FLOOR ELEVATION	TC	TOP OF CURB
FGFW	FINISHED GRADE AT FOOT OF WALL	TYP	TYPICAL
FL	FLOWLINE	TW	TOP OF WALL
G	GUTTER	V_P	VOLUME PROVIDED
GR	GRATE	V_R	VOLUME REQUIRED
HP	HIGH POINT	WSE	WATER SURFACE ELEVATION
INV	INVERT		

PAVING, GRADING AND DRAINAGE NOTES

1. GRADE TO DRAIN
2. GRADE 4' WIDE DRAINAGE SWALE TO DRAIN; LINE WITH 4" DIA. LANDSCAPE ROCK.
3. 2' WIDE CURB OPENING.
4. RETAINING WALL WITH SAFETY RAIL. WALL HEIGHT VARIES, PER PLAN. WALL FOOTING SHALL EXTEND BELOW TOP OF BANK TURN DOWN FOR RIP RAP, WHERE APPLICABLE ALONG EX. CHANNEL.
5. EXPOSED STEM WALL; REFER TO ARCHITECTURAL PLANS.
6. MIN. 2' SAWCUT AND REMOVE EX. A.C.C.P. ROADWAY. PROTECT EXISTING ASPHALT CONCRETE TO REMAIN.
7. INSTALL M-2 DRIVEWAY PER C.O.S. STD. DTL. 2255; SIDEWALK MODIFIED PER PLAN.
8. WIDEN A.C.C.P. ROADWAY TO LIMITS SHOWN.
9. OBLITERATE PAVEMENT MARKINGS
10. MATCH EXISTING.
11. 2' DEEP RIP RAP D50 = 6" TO BE INSTALLED AGAINST RETAINING; MATCH EXISTING
12. SAWCUT, REMOVE, AND DISPOSE OF CONCRETE TO LIMITS SHOWN OR NEAREST EXPANSION JOINT, EXACT LIMITS TO BE DETERMINED IN THE FIELD. PROTECT EXISTING ASPHALT CONCRETE TO REMAIN.
13. INSTALL MC3500 (45" ARCH PIPE) STORMTECH RETENTION SYSTEM. SEE DETAIL SHEET 2. LENGTH PER PLAN.
14. LOCALIZED INLET OVERFLOW POINT. OVERFLOW ELEV. PER PLAN.

SCALE IN FEET
0 20 40

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1102 East Missouri Ave. Phoenix, Arizona 85014 • 575 West Chandler Blvd. #123, Chandler, Arizona 85225
P:602.277.3732 • F:602.230.8488 • Info@terrascapeconsulting.com • terrascapeconsulting.com

Registered Professional Engineer (Civil) — 41715 — LISA NELSON — 03/25/19 — Date Signed — ARIZONA U.S.A.

EXPIRES 12/31/2019

DEER VALLEY TOWNHOMES

PRELIMINARY GRADING & DRAINAGE

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811 Arizona Blue Stake, Inc.
Call 811 or click Arizona811.com

DATE	DESCRIPTION
08/27/18	CITY SUBMITTAL
02/06/19	CITY SUBMITTAL
03/25/19	CITY SUBMITTAL

CHECKED BY: LMN
DRAWN BY: CMA

TITLE: **PRELIMINARY GRADING & DRAINAGE PLAN**

SHEET No. **1 of 2**

PROJECT No. **0800**

3-ZN-2017

43-DR-2019
08/14/19

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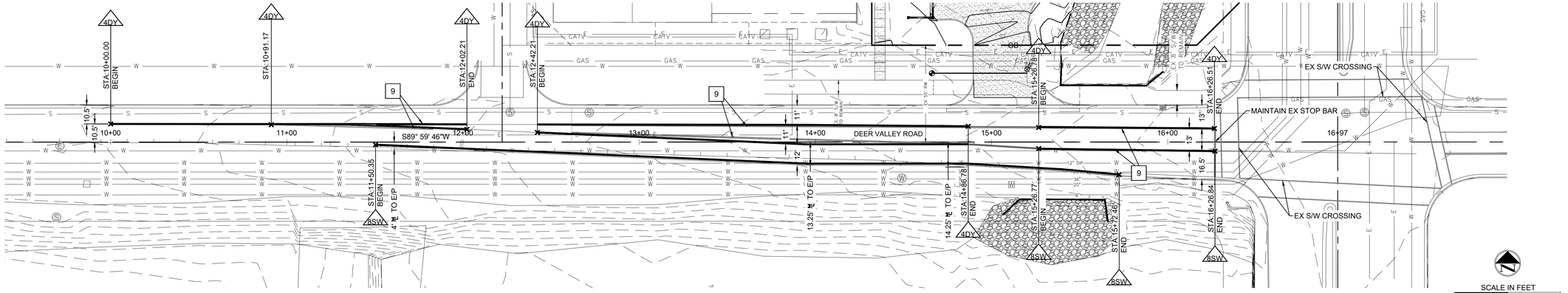

LEGEND

- BSW — 8" SOLID WHITE LINE
- 4DY — 4" DOUBLE YELLOW LINE

PAVING, GRADING AND DRAINAGE NOTES

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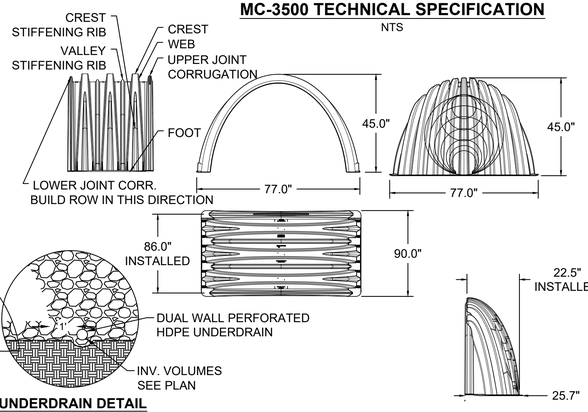
MC-3500 TECHNICAL SPECIFICATION

NTS



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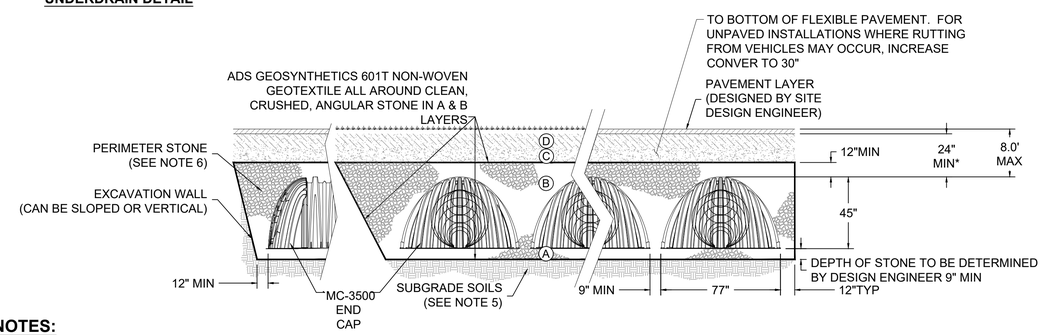

NOTES:

1. MC-3500 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

Volume Provided				
Number of chambers		6 (1 PIPE)	Volume Per Chamber	110 cf
Number of End Caps		2	Volume Per End Cap	16 cf
Area		440 sf	Excavation Length	52 lf
Perimeter		121 ft	Excavation Width	8 lf
Stone above		12 in	Excavation Depth (Including cover)	6 lf
Stone below		9 in		
Voids in stone		40 %	NOTE: TOTAL LENGTH OF STORAGE TANK = CHAMBERS PLUS END CAPS. EACH CHAMBER IS 7.17 FT IN LENGTH AND EACH END CAP IS 1.88 FT IN LENGTH.	
Length of Isolator Row		47 ft		
Volume in chambers	**# of Chambers * 109.9**	659 cf		
Volume in End Caps	**# of caps * 15.6**	31 cf		
Volume of excavation	**L X W X D**	2422 cf		
Amount of stone	**Vexc - Vchmb**	1731 cf		
Volume in stone	**Void % * Amount$_{stone}$**	693 cf		
Amount of Filter Fabric	**2*Area + Perimeter *(6 +Cover)**	1822 sf		
Volume Provided	**$V_{chmb} + V_{stone}$**	1352 cf		

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Registered Professional Engineer (Civil) 41715 LISA NELSON 03/25/19 Date Signed ARIZONA U.S.A.

EXPIRES 12/31/2019

DEER VALLEY TOWNHOMES

PRELIMINARY GRADING & DRAINAGE

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811 Call 811 or click Arizona811.com

DATE	DESCRIPTION
08/27/18	CITY SUBMITTAL
02/06/19	CITY SUBMITTAL
03/25/19	CITY SUBMITTAL

CHECKED BY: LMN

DRAWN BY: CMA

TITLE: **PRELIMINARY GRADING & DRAINAGE PLAN**

SHEET No. **2 of 2**

PROJECT No. **0800**

Plotted: 05/13/19 - 2:08 PM, By: tlei11
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43-DR-2019
08/14/19

LISTEN | DESIGN
PLAN | BUILD

terrascapeconsulting.com

Basis of Design Report
for
Sewer

FINAL Basis of Design Report

☑ **APPROVED**

☐ **APPROVED AS NOTED**

☐ **REVISE AND RESUBMIT**

CITY OF SCOTTSDALE

SCOTTSDALE WATER
9379 E San Salvador Dr.
Scottsdale, AZ 85258

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For questions or clarifications contact the Water Resources Planning and Engineering Department at 480-312-5685.

BY scan **DATE** 7/13/2020

Deer Valley Townhomes

NWC of Miller Road & Deer Valley Road

City of Scottsdale

Maricopa County, Arizona

City of Scottsdale Case Number: 43-DR-2019

TSC Project No. 0800

June 9th, 2020

Prepared for:

Beardsley 22, Inc
222 W Linger Lane,
Phoenix, AZ 85021
480-899-4330

Prepared by:

Lisa Nelson, P.E.
645 E. Missouri Avenue, Suite 160
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480-454-1807
lnelson@terrascape.us

Registered Professional Engineer (Civil)
CERTIFICATE NO.
41715
LISA
NELSON
Date Signed 06/09/20
ARIZONA U.S.A.

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43-DR-2019
6/25/2020

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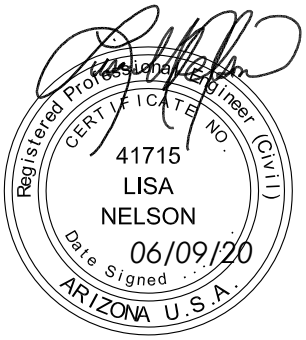
Appendix A: Grading & Drainage Plan

REFERENCES:

- 2018 City of Scottsdale Design Standards and Policies Manual – Chapter 7 (Wastewater)
- ADEQ Engineering Bulletin No.1 – Chapter 4 (Sewerage collection Systems)
- International Plumbing Code 2015



1.0 Introduction

The proposed Deer Valley Townhomes development (Project) consists of attached townhomes split between three (3) buildings, 9 units on a one acre parcel. The proposed total disturbed area is 0.68 acres which include approx. 12,332 SF of building area. The lowest finished floor elevation of the site is 1779. The Site is defined by the parcel boundary for APN# 212-02-010E and is located at the northwest corner of Miller Road and Deer Valley Road in Scottsdale (see figure 1 below). The project zoning is R-3. The Site is currently undeveloped and the proposed development will be constructed all at once and will not be phased.

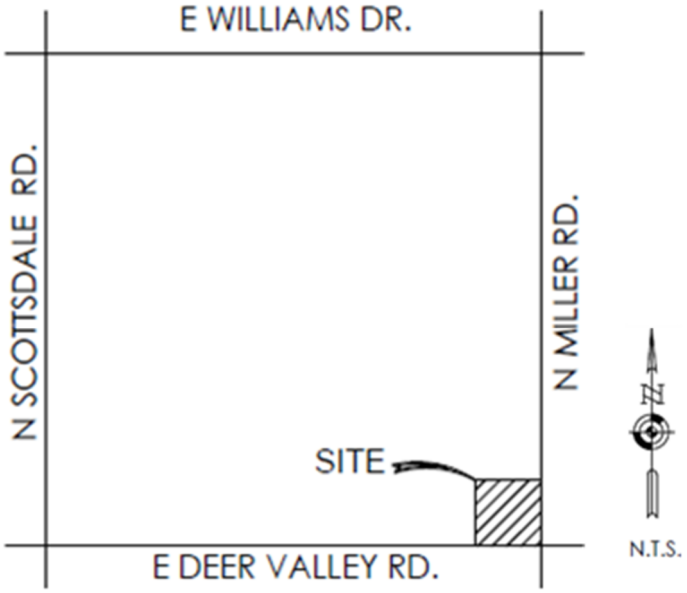


Figure 1 Vicinity Map

The purpose of this report is to evaluate the existing infrastructure and to determine if the proposed design will adequately support the calculated demands for the proposed developed Site. The Project will be designed and developed in accordance with the 2018 City of Scottsdale Design Standards & Policies Manual (DSPM), County, and State requirements.

2.0 Sewer System

The Site is a vacant lot with a channel along the east side. There are several existing sewer lines surrounding the property, according to City quarter section maps. An existing sewer line exists in Calistoga Circle with a service stub extends into the Site at the northwest corner. An 8" PVC sewer line exists in Miller Road that flows south. Deer Valley Road has an existing 8" VCP sanitary sewer line that flows east to west.

The proposed sewer system will tie into the existing sewer line in Dear Valley Road with a proposed sanitary sewer manhole. **Appendix A** shows the connection

location. An 8" PVC sewer line will service the Site with 6" laterals in the east and west direction and 4" building connections to each unit. The building connections are proposed 3.4' below finished floor elevation. Refer to Preliminary G&D Plan in **Appendix A** for proposed sewer system layout. The onsite sewer system will be privately owned and maintained.

Based on discussions with the City of Scottsdale, the downstream sewer main and wastewater treatment plant has sufficient capacity to support the Project's sewer proposed flows. The sewer flow from the Project will be conveyed to the City of Scottsdale Wastewater Treatment Plant, 4.2 miles downstream.

3.0 Sewer Analysis

3.1 Jurisdictional Design Criteria

Based on the DSPM all sewer lines shall be designed to provide a minimum peak flow velocity of 2.5 feet per second and a maximum velocity of 10.0 feet per second. The depth to diameter ratio (d/D) for gravity sewer shall not exceed 0.65. A Manning's roughness coefficient, "n", of 0.013 will be used for all pipe materials. Per ADEQ Engineering Bulletin No.11, Chapter 4, Table IV-1, in order to maintain a minimum velocity of 2.5 fps, the minimum slope requirement for eight (8) inch diameter sewer is 0.52%. 4" and 6" pipes will be utilized as laterals or building connections and shall have a minimum slope of 2.08% per International Plumbing Code (2015 IPC). Cleanouts are located at any direction change greater than 45° or at the end of the line. All buildings are required to have a two-way cleanout at the building per IPC. Cleanout spacing is equal to or less than 100'.

3.2 Proposed Wastewater Flows

This report supplements preliminary plans proposing 9 residential units. As a result, the final total projected wastewater flow is calculated as follows:

Average Daily Demand =	100 gpcpd
Average Daily Flow (ADF) = 9 DU x 100 gpcpd x 2.5 p/DU =	2,250 gpd
Peak Daily Flow (PDF) = ADF x 4.0 =	9,000 gpd

*ADF based on DSPM section 7-1.403.A
*PDF based on DSPM figure 7-1.2

3.3 Sewer Calculations

- Flow capacity per Manning's formula for uniform pipe flow:

$$Q = \frac{1.49}{n}(A)(R_h)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

Q =	*Pipe capacity (cfs)*
n =	*Manning's roughness coefficient*
A =	*Cross sectional area (ft²)*
R =	*Hydraulic radius (ft.)*
S =	Minimum slope (ft/ft)

The flowing full (d/D=0.65) capacity for the proposed 8" sewer line into the Site with a minimum slope of 0.52%:

$$\frac{1.49}{0.013}(\pi 0.33^2)(0.19)^{\frac{2}{3}}(0.0052)^{\frac{1}{2}} = 0.93\ cfs = 601{,}074\ gpd$$

9,000 gpd << 601,074 gpd pipe capacity

The flowing full (d/D=0.65) capacity for 6" lateral to serve the 4" building services at a minimum slope of 2.08%:

$$\frac{1.49}{0.013}(\pi 0.25^2)(0.14)^{\frac{2}{3}}(0.0208)^{\frac{1}{2}} = 0.88\ cfs = 568{,}759\ gpd$$

9,000 gpd << 568,759 gpd pipe capacity

The capacity for the existing 8" sewer main in E. Deer Valley Road (1.24% slope, generated from As-Built plan), d/D=0.65:

$$\frac{1.49}{0.013}(\pi 0.33^2)(0.19)^{\frac{2}{3}}(0.0124)^{\frac{1}{2}} = 1.44\ cfs = 930{,}696\ gpd$$

9,000 gpd << 930,696 gpd pipe capacity

- Flow velocity per Manning's formula for uniform pipe flow:

$$V = \frac{1.49}{n}(R_h)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

V =	*Pipe velocity (ft/s)*
n =	*Manning's roughness coefficient*
R_h =	*Hydraulic radius (ft.)*
S =	Minimum slope (ft/ft)

The velocity computed for an 8" sewer line flowing full capacity d/D=0.65 and a 0.52% slope:

$$\frac{1.49}{0.013}(0.19)^{\frac{2}{3}}(0.0052)^{\frac{1}{2}} = 2.73\ ft/s$$

2.5 fps < 2.73 fps <10 fps

4.0 Conclusion

As demonstrated, the proposed sewer system for Deer Valley Townhomes will be in accordance with the 2018 City of Scottsdale Design Standards & Policies Manual and have the capacity to service 9 townhomes on a one acre site. The project demand is less than the 8" sewer line capacity and an acceptable velocity is achieved. The Site flow is insignificant compared to contributing flows from the surrounding development and therefore the impact on the City main is negligible.

APPENDIX A

PRELIMINARY GRADING & DRAINAGE PLAN

PRELIMINARY GRADING AND DRAINAGE PLAN FOR:

DEER VALLEY TOWNHOMES

N MILLER ROAD & E DEER VALLEY ROAD

SCOTTSDALE, ARIZONA

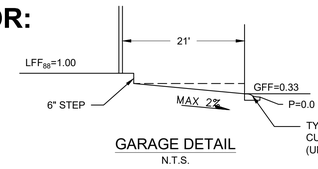
A PORTION OF THE SOUTHWEST QUARTER OF SECTION 14, TOWNSHIP 4 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA.

Flow	
Q= CIA**	Q = Flow (cfs)
	C = Average Runoff Coefficient*
Q = 0.94 x 8.05 x 0.68	I = Precipitaion Intensity (100-yr, 5-min) (in/hr)
Q = 5.15 cfs	A = Net Area of Disturbed Area (ac)

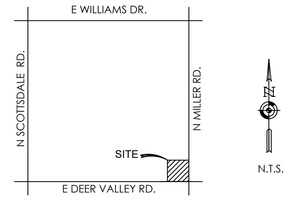
*C-Values are from FCDMC Hydrology Manual

First Flush Volume	
V= CDA**	V = First Flush Volume (cf)
	C = Average Runoff Coefficient*
V = 0.94 x 0.042 x 29,597	D = First Flush Precipitation Depth (1/2") (ft)
V = 1,168 cf	A = Net Area of Disturbed Area (sf)

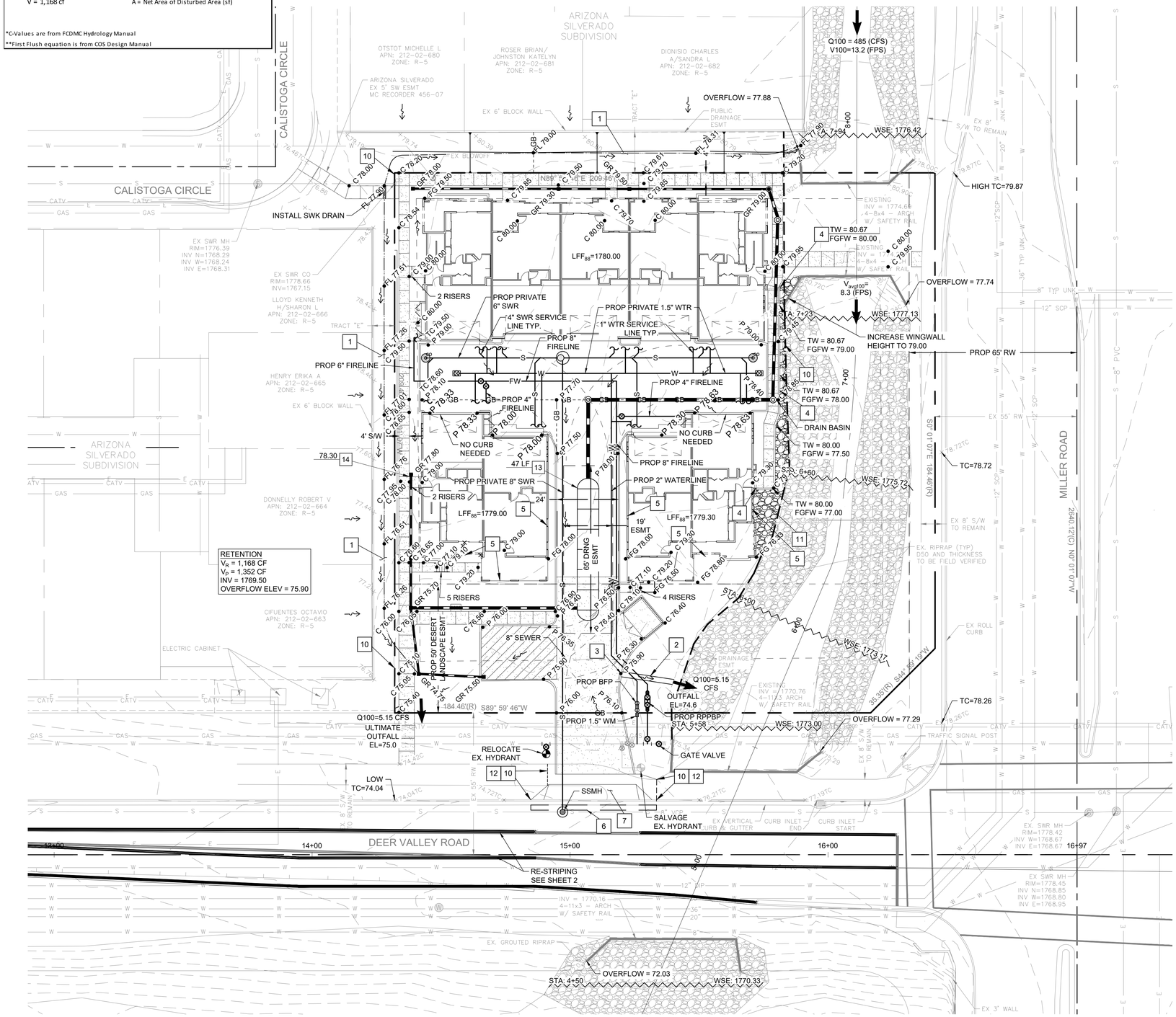
*C-Values are from FCDMC Hydrology Manual
**First Flush equation is from COS Design Manual



GARAGE DETAIL
N.T.S.



VICINITY MAP



OWNER / DEVELOPER

BEARDSLEY 22, INC
222 W LINGER LN, PHOENIX, AZ 85021

CONTACT: SCOTT WARD
PHONE: (480) 899-4330
EMAIL: WARDDEVELOPMENT@YAHOO.COM

ARCHITECT

WHITNEYBELL PERRY, INC
575 W CHANDLER BLVD, SUITE 123
CHANDLER, ARIZONA 85224

CONTACT: TERESA HILL
PHONE: (480) 857-8364
EMAIL: TERESA@WHITNEYBELLPERRY.COM

CIVIL ENGINEER

TERRASCAPE CONSULTING
645 EAST MISSOURI AVENUE, SUITE 160
PHOENIX, ARIZONA 85014

CONTACT: LISA NELSON, P.E.
PHONE: (480) 454-1807
EMAIL: LNELSON@TERRASCAPE.US

PROJECT DATA:

APN:	212-02-010E
NET AREA:	0.68 ACRES
TOTAL DISTURBED AREA:	0.68 ACRES
PARCEL AREA:	1.00 ACRES
ADDRESS:	21818 N MILLER RD, SCOTTSDALE, AZ 85255

BASIS OF BEARING

THE SOUTH LINE OF SECTION 14, TOWNSHIP 4 NORTH, RANGE 4 EAST. SAID LINE HAVING AN ASSUMED BEARING OF N 89° 32' 09" E.

BENCHMARK

A CITY OF SCOTTSDALE BRASS CAP IN HANDHOLE AT THE INTERSECTION OF SCOTTSDALE ROAD AND DEER VALLEY ROAD, C.O.S ELEVATION = 1747.03 (NAVD 88).

FEMA FLOOD INFORMATION

FLOOD ZONE DESIGNATION "X" F.E.M.A. FLOOD INSURANCE RATE MAP, MAP NUMBER 04013C1320L, PANEL 1320 OF 4425, DATED AUGUST 25, 2017. ZONE "X" AREAS DETERMINED TO BE OUTSIDE OF 0.2% ANNUAL CHANCE FLOODPLAIN.

LEGEND

- BOUNDARY
- EX PROPERTY LINE
- SETBACK
- EASEMENT
- STORM DRAIN
- S — SANITARY SEWER LINE
- W — DOMESTIC WATERLINE
- FW — FIRELINE
- DRYWELL
- STORMTECH RETENTION TANK
- GB — GRADE BREAK LINE
- EROSION SETBACK
- FIRE HYDRANT
- REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION
- CLEAN OUT WITH COLLAR
- CLEAN OUT
- VALVE
- 4' MANHOLE
- CATCH BASIN
- YARD DRAIN
- BACKFLOW PREVENTER
- WATER METER
- BLOWOFF VALVE
- 93.0 FINISHED GRADE
- WSE HEC-RAS CROSS SECTIONS WATER SURFACE ELEVATION
- COLORED PORTLAND CEMENT CONCRETE

ABBREVIATIONS

BFP	BACKFLOW PREVENTION	MH	MANHOLE
BLDG	BUILDING	P	PAVEMENT
C	CONCRETE	PROP	PROPOSED
C&G	CURB AND GUTTER	PUE	PUBLIC UTILITY EASEMENT
CO	CLEAN OUT	RW	RIGHT OF WAY
CMP	CORRUGATED METAL PIPE	RPPBP	REDUCED PRESSURE PRINCIPLE BFP
DIA	DIAMETER	SB	SETBACK
EL/ELEV	ELEVATION	SS	SANITARY SEWER
ESMT	EASEMENT	SSMH	SANITARY SEWER MANHOLE
EX	EXISTING	S/W	SIDEWALK
LFF_{88}	FINISHED FLOOR ELEVATION	TC	TOP OF CURB
FGFW	FINISHED GRADE AT FOOT OF WALL	TYP	TYPICAL
FL	FLOWLINE	TW	TOP OF WALL
G	GUTTER	V_D	VOLUME PROVIDED
GR	GRATE	V_R	VOLUME REQUIRED
HP	HIGH POINT	WSE	WATER SURFACE ELEVATION
INV	INVERT	WM	WATER METER
LS	LANDSCAPE		

PAVING, GRADING AND DRAINAGE NOTES

1. GRADE SWALE TO DRAIN
2. GRADE 4' WIDE DRAINAGE SWALE TO DRAIN; LINE WITH 4" DIA. LANDSCAPE ROCK.
3. 2' WIDE CURB OPENING.
4. RETAINING WALL WITH SAFETY RAIL. WALL HEIGHT VARIES, PER PLAN. WALL FOOTING SHALL EXTEND BELOW TOP OF BANK TURN DOWN FOR RIP RAP, WHERE APPLICABLE ALONG EX. CHANNEL.
5. EXPOSED STEM WALL; REFER TO ARCHITECTURAL PLANS.
6. MIN. 2' SAWCUT AND REMOVE EX. A.C.C.P. ROADWAY. PROTECT EXISTING ASPHALT CONCRETE TO REMAIN.
7. INSTALL CL-1 DRIVEWAY PER C.O.S. STD. DTL. 2256; SIDEWALK MODIFIED PER PLAN.
8. SAWCUT, CLEAN EDGE, WIDEN A.C.C.P. ROADWAY TO LIMITS SHOWN.
9. OBLITERATE PAVEMENT MARKINGS
10. MATCH EXISTING.
11. 2' DEEP RIP RAP D50 = 6" TO BE INSTALLED AGAINST RETAINING; MATCH EXISTING
12. SAWCUT, REMOVE, AND DISPOSE OF CONCRETE TO LIMITS SHOWN OR NEAREST EXPANSION JOINT, EXACT LIMITS TO BE DETERMINED IN THE FIELD. PROTECT EXISTING ASPHALT CONCRETE TO REMAIN.
13. INSTALL MC3500 (45° ARCH PIPE) STORMTECH RETENTION SYSTEM. SEE DETAIL SHEET 2. LENGTH PER PLAN.
14. LOCALIZED INLET OVERFLOW POINT. OVERFLOW ELEV. PER PLAN.

SCALE IN FEET
0 20 40

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Registered Professional Engineer (Civil)
41715
LISA NELSON
06/08/20
Date Signed
ARIZONA U.S.A.

DEER VALLEY TOWNHOMES

PRELIMINARY GRADING & DRAINAGE

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811
Call 811 or click Arizona811.com

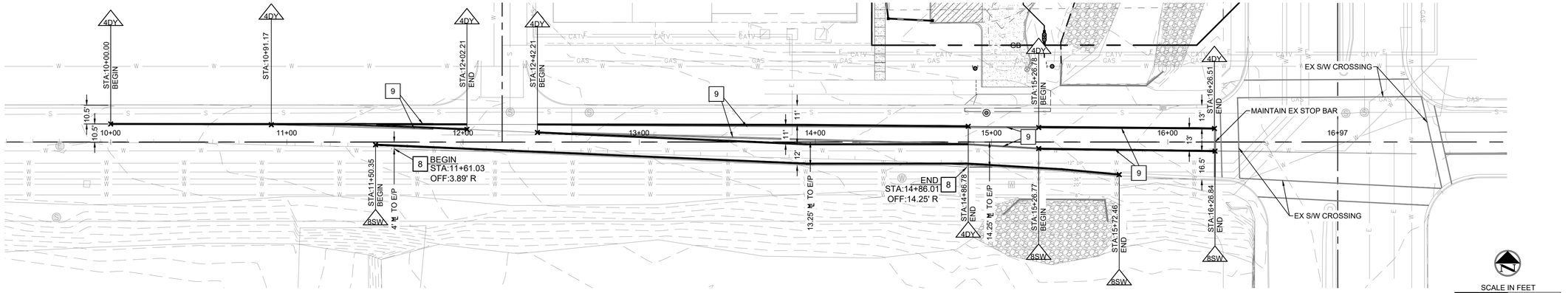
DATE	DESCRIPTION
08/27/18	CITY SUBMITTAL
02/06/19	CITY SUBMITTAL
03/25/19	CITY SUBMITTAL
02/06/20	2ND DRB SUBMITTAL
06/08/20	3RD DRB SUBMITTAL

CHECKED BY: LMN
DRAWN BY: CMA
TITLE: **PRELIMINARY GRADING & DRAINAGE PLAN**
SHEET No. **1 of 2**
PROJECT No. **0800**

3-ZN-2017

43-DR-2019
6/25/2020

Plotted: 06/14/20 - 8:57 PM, By: jill
File: M:\0800 DRY - Miller & Deer Valley - Scottsdale\ENGR\Preliminary\0800-PRELIM_GRD.dwg --> PRELIM GRD PLAN



LEGEND

- 8SW — 8" SOLID WHITE LINE
- 4DY — 4" DOUBLE YELLOW LINE

PAVING, GRADING AND DRAINAGE NOTES

1. GRADE TO DRAIN
2. GRADE 4' WIDE DRAINAGE SWALE TO DRAIN; LINE WITH 4" DIA. LANDSCAPE ROCK.
3. 2' WIDE CURB OPENING.
4. RETAINING WALL WITH SAFETY RAIL. WALL HEIGHT VARIES, PER PLAN. WALL FOOTING SHALL EXTEND BELOW TOP OF BANK TURN DOWN FOR RIP RAP, WHERE APPLICABLE ALONG EX. CHANNEL.
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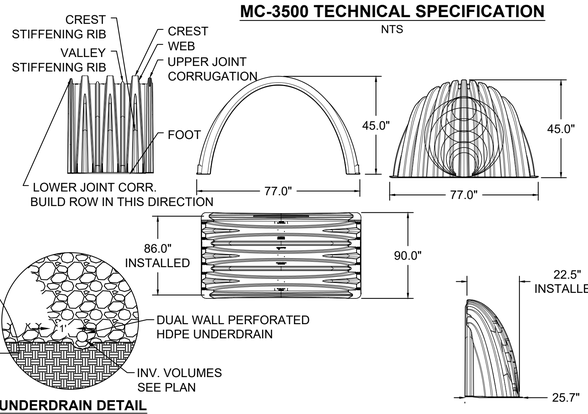
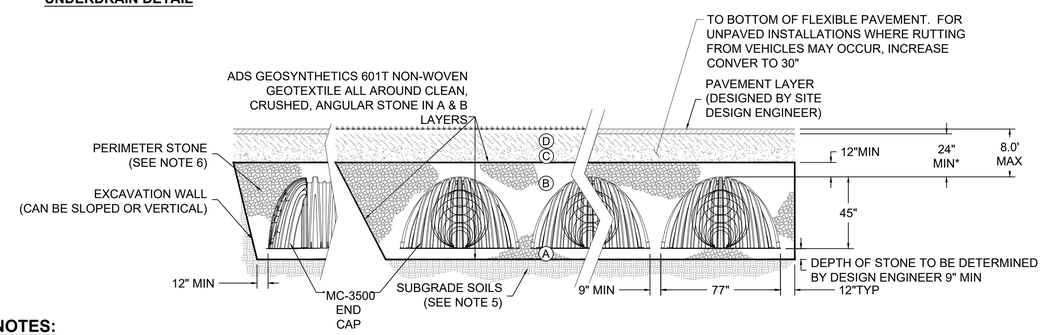
9. OBLITERATE PAVEMENT MARKINGS
10. MATCH EXISTING.
11. 2' DEEP RIP RAP D50 = 6" TO BE INSTALLED AGAINST RETAINING; MATCH EXISTING

MC-3500 TECHNICAL SPECIFICATION

NTS



UNDERDRAIN DETAIL



NOTES:

1. MC-3500 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

Volume Provided				
Number of chambers		6 (1 PIPE)	Volume Per Chamber	110 cf
Number of End Caps		2	Volume Per End Cap	16 cf
Area		440 sf	Excavation Length	52 lf
Perimeter		121 ft	Excavation Width	8 lf
Stone above		12 in	Excavation Depth (Including cover)	6 lf
Stone below		9 in		
Voids in stone		40 %	NOTE: TOTAL LENGTH OF STORAGE TANK = CHAMBERS PLUS END CAPS. EACH CHAMBER IS 7.17 FT IN LENGTH AND EACH END CAP IS 1.88 FT IN LENGTH.	
Length of Isolator Row		47 ft		
Volume in chambers	**# of Chambers * 109.9**	659 cf		
Volume in End Caps	**# of caps * 15.6**	31 cf		
Volume of excavation	**L X W X D**	2422 cf		
Amount of stone	**Vexc - Vchmb**	1731 cf		
Volume in stone	**Void % * Amount$_{stone}$**	693 cf		
Amount of Filter Fabric	**2*Area + Perimeter *(6 +Cover)**	1822 sf		
Volume Provided	**$V_{chmb} + V_{stone}$**	1352 cf		

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Registered Professional Engineer (Civil) 41715 LISA NELSON Date Signed 06/08/20 ARIZONA U.S.A.

DEER VALLEY TOWNHOMES

PRELIMINARY GRADING & DRAINAGE

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811 Call 811 or click Arizona811.com

DATE	DESCRIPTION
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CHECKED BY: LMN

DRAWN BY: CMA

TITLE: **PRELIMINARY GRADING & DRAINAGE PLAN**

SHEET No. **2 of 2**

PROJECT No. **0800**

43-DR-2019
6/25/2020

Plotted: 06/14/20 - 4:57 PM, By: jd
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